



S P E C I F I C A T I O N

Docket No. 0544MH-34266

0544MH-34266

TO ALL WHOM IT MAY CONCERN:

BE IT KNOWN that we, Arshish Kapadia and Joseph Self, residing in the State of Texas, have invented new and useful improvements in a

*Arshish*

SYSTEM AND METHOD FOR PROMISING DELIVERY OF  
CONFIGURED PRODUCTS WITH SELECTED OPTIMIZATIONS

of which the following is a specification:



## BACKGROUND OF THE INVENTION

### 1. Field of the Invention:

The present invention relates generally to electronic computer systems, and more specifically to systems and methods for automatic configuration of orders to ensure availability as desired, with selected optimizations.

### 2. Description of the Prior Art:

With the significant and accelerating increases in digital interconnectivity and machine communications in the last decade, ordering of products from a manufacturer has undergone many changes. In some industries, a sale is no longer a matter of a salesman placing an order and hoping the manufacturing plant can meet the order requirements. Instead, it is necessary to match the manufacturing capability of the plant with orders entered into the system to improve response time and maximize system efficiency.

In certain industries, one technique used by companies to distinguish themselves over their competition is to offer increased levels of customization of their products. For example, a computer manufacturer, often a systems level integrator of independently manufactured subsystems, can make available a wide variety of configuration options. This enables the purchaser to configure a custom system to meet his or her particular needs. However, allowing the purchaser this flexibility puts a tremendous burden on the manufacturer to ensure that all desired products and configurations are available, and available in a timely manner.

When a user customizes the configuration of his product, actual assembly of the product takes place after the order is entered. Examples of industries using this approach are the



1 personal computer and automobile industries. Although some  
2 products are sold pre-configured, others are assembled to the  
3 customer's order. After the order is entered, the  
4 manufacturing facility must assemble the order as specified.  
5 This after order assembly requires that predicted delivery  
6 dates be provided to the customer at the time the order is  
7 entered.

8 In recent years, to deal with this complex problem,  
9 powerful systems have been implemented to assist with order  
10 entry and custom product configuration. Products such as the  
11 RHYTHM system available from I2 Technologies, and similar  
12 products from other sources, have seen increasing acceptance  
13 as manufacturers strive to provide improved customer service.  
14 Among other features, these systems generally provide a  
15 configuration engine to assist the purchaser in defining and  
16 customizing her product. Once the product has been defined,  
17 an Available to Promise (ATP) engine ensures that all of the  
18 required components are available, and commits to a shipping  
19 date.

20 The configuration engine, also referred to as a  
21 configurator, contains a sometimes complex set of rules  
22 defining valid product configurations. Not all possible  
23 configurations of subsystems and components are allowed by the  
24 seller. For example, a company in the computer assembly  
25 industry can allow only selected combinations of processors,  
26 disk storage units, displays, and memory configurations.  
27 These limitations act as constraints on the selection of which  
28 components can be used to assemble the final product. Because  
29 even a relatively limited offering can give rise to a large  
30 number of possible component combinations, the logic required  
31 to perform the configuration function can be quite large and  
32 complex.



1 From the purchaser's perspective, an interface is  
2 provided to the configuration engine which enables component  
3 selections to be made. For example, the user can select a  
4 particular type of base computer system to be purchased. The  
5 configuration engine will then lead the purchaser through a  
6 series of selections to customize the final product as  
7 desired. Of course, the customer is entitled to select a  
8 predefined package, but it is often the case that one or more  
9 variations from the standard product is desired.

10 As each selection is made, it imposes additional  
11 constraints on the set of valid configurations. Thus, prior  
12 selections constrain the user in making later selections. For  
13 example, in the computer assembly context, purchaser selection  
14 of a laptop computer, as opposed to a desktop model, will  
15 influence the components which may be selected to go into the  
16 final product. For example, once a laptop has been selected,  
17 only displays which are compatible with that laptop may be  
18 selected in the future. The configuration engine maintains  
19 the relationships necessary to ensure that the purchaser  
20 selects from only valid component choices.

21 Once the purchaser has completed definition of a product,  
22 the configuration engine submits the order to the  
23 manufacturer, which may be represented to the configuration  
24 engine as an Available to Promise engine. The ATP engine  
25 confirms the availability of all of the components required to  
26 assemble the product, including the availability of sufficient  
27 manufacturing resources to assemble the components into the  
28 final product. Some of the components and resources may not  
29 be available until some time in the future. The ATP system  
30 then confirms the order back to the purchaser at the user  
31 interface, provides a delivery date, and commits the  
32 components and resources at the manufacturing level.



1 When presenting a list of selections to a user, some  
2 systems will designate a default selection for the user. This  
3 is generally a selection chosen ahead of time by the  
4 manufacturer so that the final configuration defined by the  
5 user will be complete. In other words, use of a default for  
6 each selection enables a complete product to be configured.

7 It would be desirable to provide a mechanism for choosing  
8 a default user selection which maximizes or minimizes some  
9 function desired by the manufacturer. It would be further  
10 desirable to perform such selection at the time the user is  
11 selecting his product configuration in order to provide and  
12 enhance the default selection decision.

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## SUMMARY OF THE INVENTION

Therefore, in accordance with the present invention, a default selection to be presented to a user at configuration time is determined at the time a selection list is presented to the user. A desired function, such as profit maximization or price minimization, is applied against each of the available selections. The selection which thus meets the function's criteria is designated as the default selection, and presented to the user as such. The user may, of course, select any item on the list, but accepting the default selection will tend to maximize desirability of the final product in accordance with the criteria defined by the manufacturer. In accordance with an aspect of the invention, the criteria to be used in choosing default selections may itself be defined at run-time, so that different default selections will be presented to, for example, different users. Defaults are designated for all configuration choices which need to be made for the product, so that a complete product is defined even when the user does not make, or has not yet made, selections for all choices.



## BRIEF DESCRIPTION OF THE DRAWINGS

The novel features believed characteristic of the invention are set forth in the appended claims. The invention itself however, as well as a preferred mode of use, further objects and advantages thereof, will best be understood by reference to the following detailed description of an illustrative embodiment when read in conjunction with the accompanying drawings, wherein:

Figure 1 is a high level block diagram of an order entry system in accordance with the present invention;

Figure 2 is a flowchart illustrating operation of a preferred embodiment of the order entry system of the invention;

Figure 3 is a flowchart illustrating a method for optimizing selection of a default item to be presented to a user; and

Figure 4 is a block diagram illustrating further details of the preferred embodiment.



## DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention is useful in the context of order entry for industries which allow product customization by customers, but is not limited to such applications. The examples and description below, for purposes of illustration, assume that a user wishes to customize a single product, and that the product will be assembled, or assembly will be completed, only after an order is finally entered and committed. The customization process is assumed to allow a user to select items, or components, from lists of choices to provide the customized product. For each portion of the product which can be customized, one or more selections form a list will need to be made by the user.

The present invention pertains to identification of a default selection to be presented to a user out of a list of selections at configuration time. In order to best identify a preferred default selection, in the preferred embodiment it is necessary to provide configuration-time information regarding products which are available to be chosen by the user. Co-pending patent application serial no. \_\_\_\_\_, titled "System and Method for Promising Delivery of Configured Products", attorney docket no. 0544MH-34245, filed concurrently herewith, describes in detail a preferred system which provides the necessary coupling. The description which files also describes a preferred system which can be utilized to implement the present invention, but additional details of the underlying system can be filed in the referenced patent application which is hereby incorporated by reference herein.

As illustrated in Figure 1, a purchaser enters an order through a user interface 10. The user interface 10 is connected to a configuration engine 12, also referred to as a configurator, which provides the intelligence to restrict the selections made by the user to a set defined in advance by the





1 manufacturer. The configuration engine 12 includes logic  
2 implementing a set of rules and relations defining the  
3 allowable configurations of components which may be selected  
4 by the user to configure products sold by the manufacturer.

5 The configuration engine 12 is connected to an available  
6 to promise (ATP) engine 14. As known in the art, the ATP  
7 engine 14 includes a database which identifies all components  
8 and subsystems which are currently actually available, and the  
9 dates on which they can be shipped. Subsystems of components  
10 can be shipped only on the latest date all of the components  
11 which make up that subsystem are available. The ATP engine  
12 commits to dates on which the components and subsystems will  
13 be available to ship to the purchaser.

14 In prior art systems, a completed order was submitted to  
15 the ATP engine 14 by the configuration engine 12. In the  
16 present invention, however, the configuration and ATP engines  
17 12, 14 are much more tightly coupled than in prior art  
18 systems. In the preferred embodiment, a request is made to  
19 the ATP engine 14 immediately before a selection is presented  
20 to the user. The configuration engine 12 determines a set of  
21 items to be presented for selection according to its defined  
22 rules. Each of the items in the set is communicated to the  
23 ATP engine 14, which returns an indication of availability and  
24 a delivery date for each item to the configuration engine 12.  
25 The configuration engine 12, through the user interface 10,  
26 then presents to the user only those items which are actually  
27 available for selection, and the earliest delivery date on  
28 which all selections are actually available. In other words,  
29 an individual item may be available earlier, but the product  
30 is not available until the latest delivery date of the items  
31 which make up the product.

32 The term available does not necessarily mean that an item  
33 is currently in stock, but that it will be available by the



time that it is needed. Thus, when the ATP engine indicates

2 that a component will be available in two weeks, that  
3 component may not yet be physically present, but is expected  
4 to be no later than two weeks from the present time. The  
5 process of committing to product shipments can extend of many  
6 levels of manufacturing, so that the final assembly entity  
7 assumes availability of products which are currently several  
8 levels down the manufacturing chain. So long as all  
9 manufacturers are able to meet their commitments, the products  
10 will actually be there when needed. Communication with  
11 suppliers to keep the incoming product pipelines full is one  
12 of the functions of the ATP engine.

13 Once a selection is made by the user, the configuration  
14 engine 12 determines a next set of items to be presented for  
15 selection. The above process is repeated until the product is  
16 completely configured. Once a final product configuration is  
17 obtained, it is submitted to the ATP engine for a commitment  
18 of the order. Because each selection was made from a list of  
19 items known to be available, the user is constrained to enter  
20 only valid and available product configurations. The only  
21 circumstance in which a final order can be rejected is if one  
22 or more items become unavailable between the initial selection  
23 of that item and final order commitment, which is a relatively  
24 unlikely event.

25 Figure 2 is a high level flowchart giving more details of  
26 the process outlined above. The following description assumes  
27 that only a single product is being configured, but the same  
28 steps are used when multiple products are purchased in a  
29 single order.

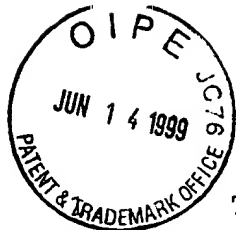
30 Initially, the product to be purchased is selected by the  
31 user 20. The configuration engine contains sets of static  
32 configuration constraints for each product, and the  
33 appropriate static configuration is set up for the selected



1 product. Unlike prior art systems, no static default  
2 selections are established for each item. Instead, defaults  
3 are preferably dynamically selected based upon an optimization  
4 function defined by the manufacturer and applied to the  
5 database of available items at run time. At any time, if the  
6 user wishes to accept the product, even if more choices can be  
7 made for some components, the user can end the configuration  
8 process and accept a complete product. If any additional  
9 constraints are to be applied to the configuration, such as  
10 requiring a particular ship date, these are defined and  
11 entered into the configuration engine for use in pruning  
12 future selections.

13 Although it is useful that defaults selections are  
14 presented as such to the user, an important part of the  
15 preferred implementation is that defaults are selected so that  
16 a complete product is defined. For a product to be completely  
17 defined, certain items must be selected out of the sets of  
18 available items. For example, a car requires a body, engine,  
19 and interior, but an air conditioner may not be required.  
20 Unless all of the required selections are made, the product is  
21 not complete.

22 In the preferred embodiment, a complete product is always  
23 defined. When a configuration session begins, the  
24 configuration engine determines which selections must be made  
25 for the product to be complete, and makes default selections  
26 for them at the beginning. Then, no matter what selections  
27 are made by the user, a complete product is always defined.  
28 if the user does not make selections from some lists of items,  
29 the product remains complete. Thus, the user need only make  
30 those selections that are of interest to him, with all  
31 remaining selections being fulfilled by the defaults  
32 originally selected by the configuration engine.



The configuration engine then determines a set of items to be presented to the user for selection 24. The initial set, and subsequent sets based upon earlier selections made by the user, are defined via constraints within the configuration engine in a manner known in the art. Before actually displaying the items and allowing the selection to be made, the ATP engine is queried to determine the actual availability of each of the items 26. This may be done by collecting all of the items into a group and making a single query, with the ATP engine returning a result data structure 28 containing an indication of availability and possible shipping date for each item. In practice, to reduce the number of queries to the ATP engine, an implementation can move some constraints from the ATP engine to the configuration engine, but the conceptual operation is unchanged. Constraints suitable for moving to the configuration engine are those for items which have no shared dependencies. (ie, those items not used in more than one subassembly)

In the preferred embodiment, the act of querying the ATP engine for availability does not enter an order and commitment transaction. In other words, the items which are the subject of the query are not reserved or committed at the time of the inquiry, but are only committed later at the time of final order entry. This could result in a user defining a product which is a valid, available configuration when defined, but which becomes unavailable by the time the final order is entered for confirmation and commitment. However, this approach avoids the problems which can occur as a result of committing each component as it is selected, followed by uncommitting these components later if the configuration is changed or no final order is entered. Although not preferred, the latter approach can be used in certain circumstances if desired.



1 In addition, most problems are avoided by a reasonably  
2 intelligent ATP engine. When the actual supply of a component  
3 runs low, or the expected availability of that component in  
4 the future becomes borderline or uncertain, the ATP engine can  
5 treat the situation as one in which the component is simply  
6 unavailable. Additionally, a high level of enquiries for a  
7 component indicates that orders will probably be placed  
8 against the components very soon, so that tracking such  
9 enquiries may indicate that a component should be indicated as  
10 unavailable even though the number of actual commitments has  
11 not depleted the supply. Good requirements planning will also  
12 minimize any problems.

13 After the query result is received from the ATP engine,  
14 a list of valid, available selections is presented 30 to the  
15 user. Typically, an indication is made to the user of the  
16 available shipping date for each selection. This allows the  
17 user to see the impact on delivery of decisions made during  
18 configuration. If the user defined a preferred shipping date  
19 as a constraint in step 22, this constraint is used to further  
20 prune the list of valid selections before presentation to the  
21 user. In other words, the configuration engine considers as  
22 unavailable any component which is only available after the  
23 required shipping date. This may mean that less  
24 configurations are available for the user than is the case  
25 with unrestricted dates, but the user can balance desired  
26 delivery dates against the possibility of more options to  
27 choose from.

28 The user then selects one of the available options from  
29 the list, which the configuration engine accepts 32 and uses  
30 to update the product configuration 34. The updated product  
31 configuration may impose additional constraints on later  
32 choices, and may also make additional choices available. For  
33 example, if a user is configuring a truck, selection of a  
34 larger engine may make future selections of tires and fuel



1 tank available which would not be the case if a smaller engine  
2 were selected. If a selection will make additional selections  
3 necessary to completely define a product, additional default  
4 selections will be added to the configuration as well. As was  
5 the case with step 20, this ensures that a complete product  
6 configuration is always defined.

7 If the final user selection has not yet been made (step  
8 36), the configuration engine determines the next set of items  
9 for selection 24 and repeats the process. Earlier selections  
10 modify the initial constraints as described above.

11 Once the last selection has been made (step 36), or if at  
12 any time the user indicates that for the remaining selections  
13 the defaults are acceptable, a completed order for the product  
14 is submitted to the ATP engine 38. This submission is  
15 different from the previous enquiries for availability, in  
16 that order submission causes the ATP engine to commit the  
17 necessary components and resources required to assemble the  
18 product. If component or resource availability have changed  
19 during the configuration process, it is possible that the ATP  
20 engine may not be able to commit to the final order, or that  
21 the commit date will be later than previously determined.  
22 Because this is a relatively unlikely event, the preferred  
23 embodiment provides for no commitment until the final order is  
24 entered, rather than committing resources and components  
25 during the configuration process, which may have to be undone  
26 relatively more often.

27 At this time the process for configuring the product is  
28 complete. Of course, additional products may be configured in  
29 a single session, and orders may be withdrawn with the  
30 accompanying requirement for reversing the resource and  
31 component commitments previously made. These typical  
32 procedures are known in the art, and may easily be  
33 incorporated into the process of the invention.

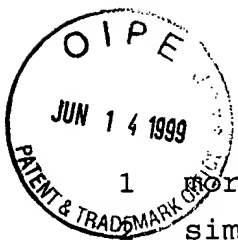


1 In addition to providing a completely configured product  
2 for the user, a manufacturer may have additional goals  
3 connected with the sale of the product. These goals can be  
4 realized by using optimized defaults as will now be described.

5 Because it is common for users to select an item which  
6 has been presented as a default, out of each list, intelligent  
7 selection of such defaults can be used meet optimization goals  
8 defined by the manufacturer. These optimization goals can  
9 include, for example, maximizing profit of the final product,  
10 maximizing profit on each of the components included within  
11 the product (a closely related problem), minimizing overall  
12 price of the product, and increasing sales of components  
13 selected by the manufacturer, such as those which may  
14 currently be in an overstocked condition. The user is always  
15 free to select any item from the available list, but the  
16 selection of choices presented as defaults enables intelligent  
17 configuration default utilization to assist in the  
18 manufacturer's optimization goals. IN addition, many  
19 available choices are of no interest to the user, and no  
20 selection at all is made for these. Here, the defaults  
21 selected by the system become the user's "choices."

22 In general, intelligent identification of default  
23 selections is performed dynamically. The item presented as  
24 the default may change over time, and as a function of user  
25 identity or needs. The previously described tight coupling  
26 between the configuration engine and the ATP engine enables  
27 this optimization to be performed in a relatively  
28 straightforward manner.

29 During each configuration session, an optimization  
30 function is identified which is to be applied to selection of  
31 default items. These defaults ensure a complete, valid  
32 product configuration at all times, and will be presented to  
33 the user as defaults when selections are made. If desired,



1 more than one optimization function can be operated  
2 simultaneously, although this complicates the calculation  
3 somewhat. The optimizations to be applied can be determined  
4 in part by the user and in part by the manufacturer. For  
5 example, if the user is configuring a computer system,  
6 indication that this system is to be used in the home might  
7 indicate that a minimum retail price optimization is to be  
8 used, whereas identification that this computer is to be used  
9 in the office might cause a "maximize profit" optimization to  
10 be used. In either case, it is possible that the manufacturer  
11 could have an additional optimizing function for preferring an  
12 overstocked component regardless of the price or profit  
13 associated with the items in the selection list.

14 When the available items are returned from the ATP  
15 server, associated with each available item is information  
16 necessary for the configuration engine to determine which  
17 should be selected as the default item. If the optimization  
18 criteria is to minimize price by minimizing the price of each  
19 of the items, each item that is available must return with it  
20 data indicating the price of that item. If the optimization  
21 goal is to maximize profit, each of the available items must  
22 return a profit number associated with that item so that the  
23 configuration engine can select the highest profit item for  
24 presentation to the user as the default. Of course, any other  
25 criteria to be used in the optimization decision is returned  
26 to the configuration engine in a similar manner.

27 FIGURE 3 is a flowchart outlining how the selection of  
28 the default item is made within the configuration engine.  
29 Initially, the configuration engine receives a list of  
30 available items from the ATP engine 50. As described above,  
31 only items which are actually available will be returned from  
32 the ATP engine. Along with the list of available items, is  
33 the information needed to make the optimization decision. As  
34 described above, this can be, for example, price or profit





1 information, but can be any information about the available  
2 items which the manufacturer wishes to use to make the  
3 optimization decision.

4 Each item in the returned list is compared to the  
5 optimization criteria 52, and the item with the best value  
6 matching the optimization criteria is selected as the default  
7 item 54. When the list of the available is presented to the  
8 user, the default item is identified as such to the user 56.

9 The format in which the default item is identified to the  
10 user will, of course, depend upon the details of the user  
11 interface. The default item may, for example, be placed at  
12 the top of a column to be selected. It may also be  
13 highlighted or designated in some manner, and the default item  
14 may be placed in a location of preference, such as an  
15 interface box in which the user identifies the item to be  
16 selected. Those skilled in the art will recognize numerous  
17 alternative techniques which can be used to present the  
18 selected default item to the user.

19 Figure 4 illustrates additional details of the preferred  
20 implementation. Within the configuration engine 12, the user  
21 has a set 60 of three items 62, 64, 66 from which to choose.  
22 These items may be referred to as configuration options, as  
23 they are the options the user has to place into her  
24 configuration. Each configuration option corresponds to an  
25 orderable item 68, 70, 72. Of course, in an actual  
26 implementation the sets of options and orderable items in the  
27 configuration will be much more complex, but this simple  
28 example serves to illustrate operation of the invention.

29 Prior to submitting a group of items to the user for  
30 selection, the configuration engine sends a request to the ATP  
31 server to determine which items are available. The items 68,  
32 70, 72 are communicated to the ATP engine, which contains



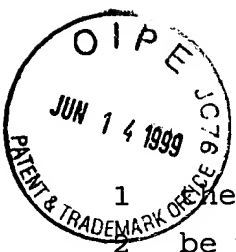
1 information about all items available in the system. In the  
2 example of Figure 4, orderable item 68 corresponds to one  
3 manufacturable item 74, orderable item 70 corresponds to three  
4 (76, 78, 80), and item 72 is not available.

5 The three items 76, 78, 80 are alternative manufacturable  
6 items, any of which can be used to satisfy the request for  
7 orderable item 70. For example, if item 70 is an eight  
8 gigabyte hard drive for a computer system, items 76, 78, and  
9 80 could represent products by different manufacturers.  
10 Availability, cost, and profit margins could be different for  
11 each of these items, which will be reflected in the selection  
12 of a default item to present to the user.

13 The types and relationships of items which can be used to  
14 fulfill a request can be relatively complex. For example, in  
15 Figure 4 manufacturable item 78 can be an assembly comprising  
16 two subassemblies 82 and 84, and subassembly 82 can itself be  
17 made from parts 86 and 88. The structures representing  
18 relationships and subrelationships can extend as deeply as  
19 needed to describe the available products. It can, in fact,  
20 extend to other companies which supply the assemblies and  
21 subassemblies needed by the manufacturer.

22 The request to the ATP server results in a list of  
23 available items being passed back to the configuration engine  
24 12. This enables the configuration engine 12 to determine  
25 which item is to be presented to the user as the default  
26 selection item. In the example shown, item 70, corresponding  
27 to the user's selectable option 64, is presented as the  
28 default.

29 The selection of items to be presented as defaults can  
30 extend more deeply than just the items being presented to the  
31 user. In the example shown in Figure 4, assume that the  
32 optimization being used is to minimize retail price. Each of



1 The manufacturable items 76, 78, 80 are alternates which can  
2 be used to satisfy an order for item 70. Each manufacturable  
3 item 76, 78, 80 has a retail price associated with it, and  
4 they may be different. The ATP engine can select which of the  
5 three 76, 78, 80 has the lowest retail price, and return that  
6 as the manufacturable item corresponding to orderable item 70.  
7 Thus, the optimization proceeds not only between orderable  
8 items 68, 70, 72, but also among the items which can be used  
9 behind the scenes to satisfy the orderable item requests.

10 In the case of more complex optimizations such as just  
11 described, it is often preferred to have the process of  
12 selecting default items to occur in the ATP engine rather than  
13 in the configuration engine. This allows the ATP engine to  
14 select from all available product components to provide the  
15 best selection for the default. In this approach, the  
16 configuration engine need merely pass to the ATP engine an  
17 identification of the type of optimization desired, and the  
18 best default selection will be flagged when the list of  
19 available items is returned to the configuration engine. This  
20 places a slightly greater computational burden the ATP engine  
21 for each availability transaction, but allows greater  
22 flexibility and intelligence in the optimization process.

23 In addition, more than one optimization may proceed  
24 concurrently, as previously described. If, for example,  
25 manufacturable item 68 is currently overstocked, the ATP  
26 engine can also be instructed to indicate such item as the  
27 default unless there is a price difference between it and the  
28 lowest priced item of a selected amount. This would allow  
29 manufacturer dynamic situations to influence the optimization  
30 process beyond a simple one such as minimize price. It is  
31 generally more efficient and easier to provide all  
32 optimization calculation in the ATP engine if multiple  
33 concurrent optimizations are to be calculated concurrently.



1 In addition to the optimizations discussed above, a  
2 second level of optimizations is preferably carried out within  
3 the ATP engine. In many cases, the user will not select the  
4 item designated as the default. When this happens, the ATP  
5 engine can still perform optimizations on the selection made  
6 by the user when alternatives are available. This allows the  
7 manufacturer to optimize to the extent possible within the  
8 selections made by the user, in addition to whatever  
9 optimization occurs as a result of designating default  
10 selections.

11 For example, suppose the user is configuring a computer  
12 system. The default selected at the initiation of the session  
13 designates a 2 gigabyte hard drive as the default. During  
14 configuration, the user selects an 8 gigabyte hard drive. The  
15 ATP engine can still perform optimizations on this selection  
16 by choosing, from several alternatives available, the one that  
17 best fits the optimization function. For example, if the  
18 system is being optimized to minimize cost, the least  
19 expensive 8 gigabyte hard drive can be selected by the ATP  
20 engine for inclusion in the system.

21 This optimization would actually be performed prior to  
22 the selection by the user. When the alternatives are being  
23 checked for availability, the 8 gigabyte hard drive best  
24 fitting the optimization function is selected initially, so  
25 that when the user selects that option it is already the best  
26 optimized selection. In the above example, the user, by  
27 selecting an 8 gigabyte hard drive, is selecting the least  
28 expensive one available, because the cost optimization process  
29 has already been performed among the available 8 gigabyte hard  
30 drives.

31 It is not necessary, or in some cases even possible, for  
32 perfect optimization to be calculated for each item set to be  
33 presented to the user. For example, selecting the lowest



1 price for each component will generally result in either the  
2 lowest, or near to it, total product price being selected.  
3 However, sometimes selecting the lowest priced component now  
4 will place a constraint on future selections which will  
5 actually raise the final total price somewhat above the lowest  
6 possible one. Generally, it will not be desirable to perform  
7 a complex calculation of all possible item combinations to  
8 select the one leading to the actual lowest price. This would  
9 complicate the optimization calculation by adding product  
10 configuration constraints, and would seldom result in a  
11 significantly better result. Instead, the preferred technique  
12 provides for optimization of each selection step  
13 independently. Thus, for a maximal profit optimization, the  
14 preferred approach is to determine the maximum profit of the  
15 items available at each stage of the selection.

16 Optimization functions can be selected to be as simple or  
17 complex as desired. Optimization of a function using  
18 alternative choices as described is well within the skill of  
19 those skilled in this art, and will not be described in  
20 detail. Suffice it to say that any abstract business  
21 criterion which can be expressed mathematically can be used  
22 for optimization. For example, the price minimization and  
23 profit maximization functions described above can be used.  
24 The described goal of preferring overstocked items, or other  
25 items having a special status for the manufacturer, will be a  
26 common optimization. Optimizing delivery dates is another  
27 approach. Rather than simply indicating to the user how each  
28 selection will impact his product delivery date, the indicated  
29 default can be the item which provides for the shortest time  
30 to delivery. Many other possibilities will be apparent to  
31 those skilled in the art.

32 Another variation on the basic approach, mentioned above,  
33 is to vary the optimization function used on a user by user  
34 basis. For example, different optimizations can be made when



1 The user is buying for home use than for a business customer.  
2 A large volume order may be given a different optimization  
3 function than a small order. Information regarding past  
4 purchases by a particular customer can be used to make  
5 optimization selections the next time he configures a product,  
6 and in fact his previous selections can be used to override  
7 calculated defaults if desired. Sophisticated systems for  
8 capturing customer information can guide optimization  
9 decisions to provide a high percentage of defaults actually  
10 selected by the user. For example, upgrades beyond the  
11 boundaries of the initial selections can be presented for  
12 users who have purchased such enhanced systems in the past.

13 The customer may even be allowed to select optimizations  
14 in order to guide the defaults which are presented to her.  
15 For example, when configuring a car, the user may be able to  
16 select for several general configuration packages, which will  
17 present different defaults. When purchasing a computer, the  
18 user may be allowed to select from optimizations based on  
19 price or maximum system capability. Within these selected  
20 optimizations, the manufacturer may select for maximum profits  
21 from otherwise equal items.

22 While the invention has been particularly shown and  
23 described with reference to a preferred embodiment, it will be  
24 understood by those skilled in the art that various changes in  
25 form and detail may be made therein without departing from the  
26 spirit and scope of the invention.